transition aluminas of this invention exhibit a low angle x-ray diffraction peak corresponding to a lattice spacing of at least 2.0 nm and wide angle diffraction peaks characteristic of an atomically ordered transition These mesostructured transition aluminas have surface areas and pore volumes that are substantially larger than conventional transition aluminas. example, commercial grades of transition aluminas have only textural porosity and lack the ordered mesoscopic network structure of the present convention. surface areas and pore volumes for these commercial grades of transition aluminas, including the commonly used gamma-alumina, are in the range 200 - 250 In contrast, m^2/q and 0.35 - 0.50 cm³/g. mesostructured transition aluminas of this invention, which we denote as MSU-Y, typically have surface areas beyond the $200 - 250 \text{ m}^2/\text{g}$ range and pore sizes well beyond $0.50 \text{ cm}^3/\text{g}$. These large surface areas and pore volumes make the mesostructured MSU-y alumina and other transition aluminas of this invention particularly attractive as catalysts and catalyst support. alumina, for instance, is widely used as a catalyst This oxide, component in petroleum refining. combination with clay, meta-kaolin, zeolites, and other oxides, comprises an important active ingredient in petroleum cracking catalysts. The commercial gamma-alumina this invention is of mesostructured expected to be an even better petroleum refining catalyst